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Marion Drain

Summary of 2015 Surface Water Monitoring Program Results
Washington State Department of Agriculture
Natural Resources Assessment Section
September 2016

Introduction

The Washington State Department of Agriculture has monitored pesticide concentrations in surface water throughout Washington since 2003. WSDA staff take water samples during the typical pesticide use season (March through September). In 2015 WSDA monitored 14 sites in Washington, two in Yakima County. State and federal agencies use this data to evaluate water quality and make exposure assessments for pesticides registered for use in Washington State.

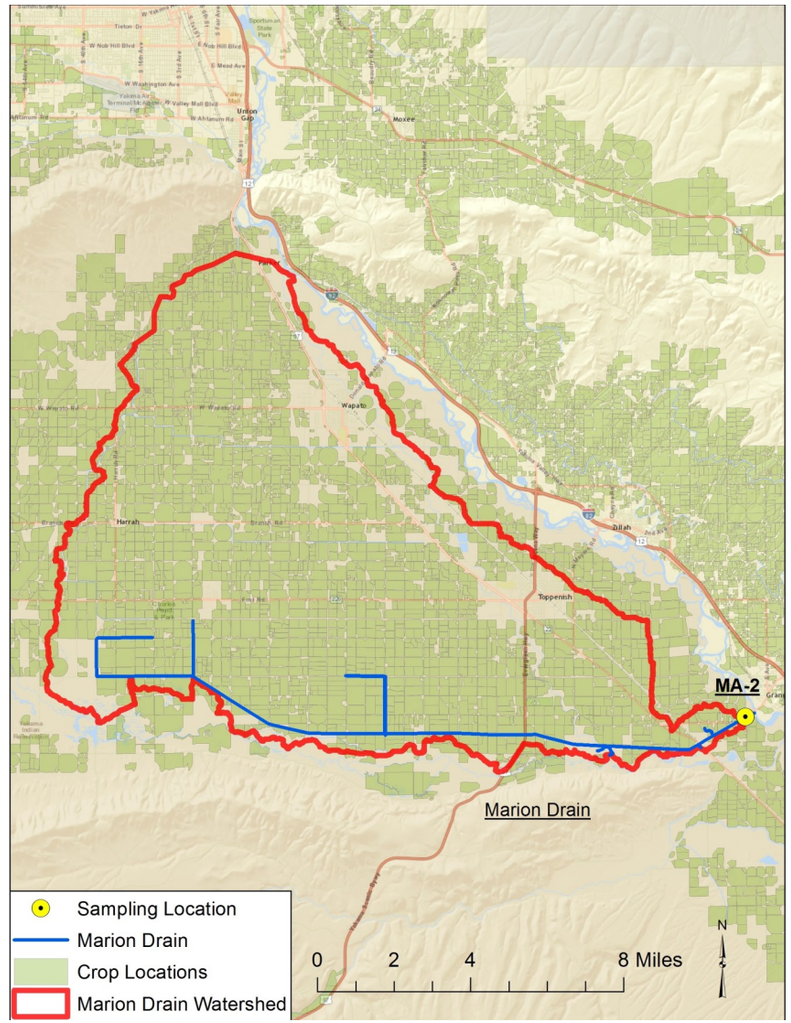
Study Area

WSDA has tested water from Marion Drain from 2003 through 2015. The watershed drains about 62,445 acres of farmland, and land use is almost completely agricultural. The main crops are field corn, hops, apple and mint. Marion Drain provides habitat for fall chinook, coho, and summer steelhead.* Sample collections occurred at this site in partnership with the Yakama Nation Environmental Management Program.

* Washington State Department of Fish and Wildlife

Sampling Details

- Samples were collected for 25 weeks, from March 10 through August 25.
- Water samples were tested for 206 chemicals: current and legacy insecticides, herbicides, fungicides, rodenticides, wood preservatives, and pesticide degradates.
- Sample analysis for pesticides and total suspended solids was conducted at Manchester Environmental Laboratory in Port Orchard, WA.
- General water quality parameters; dissolved oxygen, conductivity, pH, water temperature, and streamflow were measured at every sampling event.
- Air and water temperature (measured every 30 minutes) was monitored for the entire sampling season.
- Drought conditions resulted in less than normal streamflow throughout the season.
- Juvenile fish, of an unknown species, were frequently observed during site visits.



This table shows the pesticides detected, with dates and concentrations. They are color coded to identify which assessment criteria were surpassed. The assessment criteria used here are state and federal water quality criteria, reduced by half for safety. This 0.5 safety factor is used to make sure the criteria protect aquatic life and water quality issues are found early. Watersheds with detections above the criteria are prioritized for more monitoring and educational outreach. See http://agr.wa.gov/PestFert/natresources/SWM for more information.

Assessment Criteria
May affect fish survival at sensitive life stages
Additional level of protection for endangered species
May affect invertebrate survival
Nearing a pesticide state water quality standard
May affect fish growth or reproduction with prolonged exposure
May affect invertebrate growth or reproduction with prolonged exposure
May affect aquatic plant growth
May affect aquatic plant growth or reproduction with prolonged exposure
Below all identified criteria
No published criteria available
Not detected (below detection limit)
No Data --

Month and Day		Mar				Apr				May				Jun					Jul				Aug			
Analyte Name †	Use‡	9	16	24	30	6	13	20	27	4	11	18	26	1	8	15	22	29	6	13	20	27	3	10	17	24
2,4-D	H					.048	.051		.097		.058	.048	.043	.07	.065		.043	.042			.038		.02	.026		.039
4,4'-DDE	D-OC																									.01
AMPA	H	--	--	--	--	--	.041		.11	.082	.094	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Azoxystrobin	F							.008		.008	.009	.009	.016	.016	.016	.008		.005			.005					
Bromoxynil	H						.04	.042	.038	.033	.038		.027													
Chlorpyrifos	I-OP			.032	.027	.026																				
Dicamba	H											.019			.016			.019		.015						
Diuron	H		.004	.008	.021	.01	.018	.012	.038	.023	.012	.016	.013		.008		.005	.006	.003		.005		.004			
Fludioxonil	F					.069	.041																			
Glyphosate	H	--	--	--	--	--	.11	.16		.15	.17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Imidacloprid	I-N									.013																
MCPA	H								.039											.034						
Methomyl	I-C							.008																		
Methoxyfenozide	I		.005																							
Monuron	H		.016																							
Myclobutanil	F										.015		.015	.014	.006											
DEET	IR														.03											
Pendimethalin	H							.071	.1	.2	.15	.086	.18	.21	.21											
Propiconazole	F						.017	.016		.013																
Pyrimethanil	F					.016			.009																	
Sodium bentazon	H	.067						.098	.16	.15	.2	.11	.069	.21	.3	.46	.26	.3	.31	.43	.33	.42	.34	.33	.37	.22
Terbacil	H							.17	.7	.35	.32	.24	.25	.33	.27	.028	.026	.032	.086		.088	.28	.076	.053	.066	.019
Thiamethoxam	I-N																								.011	
Trifluralin	H										.027															
Temperature	N/A	51.19	51.08	51.39	52.56	50.38	52.39	**60.04**	**60.12**	**60.91**	**62.56**	**65.95**	**64.96**	**66.11**	**76.17**	**63.18**	**65.14**	**69.03**	**69.39**	**65.84**	**69.98**	**73.40**	**67.87**	**66.04**	**64.78**	**64.58**
Dissolved oxygen	N/A	11.05	11.43	10.25	10.13	11.37	18	21.29	18.5	17.19	17.13	12.98	13.43	16.22	18.18	16.06	13.49	12.13	13.2	10.92	12.01	17.19	12.17	11.74	12.66	14.38
Percipitation	N/A	0	0.9	0.17	0.04	0	0.1	0.03	0	0	0.08	1.05	0.33	0.02	0	0	0.01	0	0.01	0	0	0	0.1	0.23	0.15	0.1
Streamflow	N/A	169.4	163.0	227.5	286.6	348.3	38.1	20.1	29.3	18.1	17.7	74.6	38.4	20.8	6.4	2.5	10.4	11.0	8.2	5.5	13.2	6.9	10.1	16.1	17.0	23.0
Total suspended solids	N/A	14	26	28	30	27	7	5	12	5	5	15	9	2	2	< 1	1	1	2	< 1	1	2	1	2	2	3

‡ C: Carbamate, D: Degradate, F: Fungicide, H: Herbicide, I: Insecticide, IR: Insect repellent, L: Legacy pesticide, M: Multiple, N/A: Not applicable, N: Neonicotinoid, OC: Organochlorine, OP: Organophosphate, PY: Pyrethroid, *Equipment malfunction. †Units are as follows: pesticides, µg/L; temperature, °F; dissolved oxygen mg/L; percipitation, week total inches; streamflow, cfs; and total suspended solids, mg/L. **Bold**: Indicates a temperature or dissolved oxygen value above state water quality standards.

Results Summary

- Only 4 of the 129 pesticide detections were at concentrations above the assessment criteria, 3 for chlorpyrifos and 1 for 4,4'DDE.
- Chlorpyrifos detections in late March/early April were above the assessment criteria for invertebrates, indicating that intervebrate survival may have been affected. Common products containing chlorpyrifos are Lorsban and Dursban.
- A sample collected at the end of August showed levels of 4,4'DDE, a degradation product of DDT, nearing the Washington state water quality standard. DDT products are no longer registered for use, but detections such as these are attributed to their persistence in the environment.
- Temperatures in Marion Drain remained below the standard for salmonid spawning, rearing and migration habitat until late April and remained above the standard until the end of the sampling period in late August. 2015 was an unusually hot and dry year with low stream flows.

Recommendations

- Avoid drift and runoff to adjacent surface water.
- Maintain, inspect, and calibrate application equipment.
- Continue implementation of best management practices, including conservation buffers, vegetative filter strips, sediment basins, and setbacks from water. Detections of DDT and it's degradates are closely associated with total suspended solids originating from soil erosion.